DETAILED ACTION

1. Claims 31, 33-41, and 43-60 are pending in the application. Amended claims 31, 33, and 59 and cancelled claims 1-30, 32, and 42 have been noted. The amendment filed 1/19/2010 has been entered and carefully considered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 31, 33-39, 41, 43-45, and 50-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doujak et al (US 2003/0003319) in view of Yoshikawa et al ('419).

Doujak teaches a process for producing a metal wire comprising a steel core and a metal coating layer in a radially outer position with respect to the steel core, the metal coating layer comprising an alloy made of copper and zinc. The steel core is coated by alternately depositing separate layers of copper and zinc onto said core and drawing the coated core to form said alloy (e.g. brass). The copper and zinc layers may be deposited by electro-deposition or other known methods, such as CVD (Abstract, [0008], [0011]).

Doujak does not teach that each of the separate layers has a thickness of 0.5 to 20 nm.

Yoshikawa teaches depositing copper, zinc, or brass onto steel using plasma deposition (magnetron sputtering). The thickness of the layers may be 10 A to 1 μm (1-1000 nm) to have little influence on the properties of the final composite product (Col. 5, lines 25-50, Col. 6, lines 18-35).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to deposit the copper and zinc layers of Doujak using a plasma deposition method as suggested by Yoshikawa in order to form thin films having a thickness that have little influence on the properties of the final composite product.

Regarding Claims 31 and 33, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time of invention by applicant if the overlapping portion of the thickness range disclosed by Yoshikawa was selected because overlapping ranges have been held to be a prima facie case of obviousness, see In re Wortheim 191 USPQ 90.

Regarding Claims 38 and 39, Yoshikawa teaches that the coating is carried out in a vacuum chamber at a first predetermined pressure within the claimed range (Col. 8, lines 50-65).

Regarding Claims 31, 41, and 43-45, Doujak teaches that the steel core has an initial diameter of 0.8-3.0 mm, the coating layer has an initial thickness of 0.75-4.0 microns, the drawn wire has a final diameter of 0.12-0.8 mm, and the coating layer has a final thickness of 0.1-0.3 microns (100-300 nm) [0013]-[0015].

Regarding Claim 53, Doujak teaches the brass coating has a copper content of 60-72% by weight [0014].

Thus, claims 31, 33-39, 41, 43-45, and 50-53 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Doujak and Yoshikawa.

3. Claims 40, 48, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doujak et al (US 2003/0003319) in view of Yoshikawa et al ('419) as applied above and further in view of Sawada et al ('811).

Doujak and Yoshikawa do not disclose that the steel core is continuously coated and drawn.

Sawada teaches coating a metal core wire with an alloy coating by sputtering or plasma CVD in order to deposit the coating with high adhesion strength. The wire is continuously coated and drawn to form a wire of high quality and cleanliness (Fig. 2, Col. 2, lines 48-65, Col. 6, lines 1-5).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use a continuous sputtering unit as suggested by Sawada to deposit the sputtered coating of Yoshikawa in order to form a wire of high quality and cleanliness.

Regarding Claim 40, Doujak discloses depositing a layer onto the wire while conveying the wire at a speed of 18-50 m/min [0063].

Regarding Claims 48 and 49, Sawada teaches that the core wire passes through a sequence of at least two cathodes arranged in the deposition chamber (Fig. 1 and 2, Col. 5, line 35) and that the core wire passes through the vacuum chamber multiple times (Col. 4, lines 63-65).

Thus, claims 40, 48, and 49 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Doujak, Yoshikawa, and Sawada.

4. Claims 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doujak et al (US 2003/0003319) in view of Yoshikawa et al ('419) and Sawada et al ('811) as applied above and further in view of Chambaere et al ('115).

Sawada teaches conveying the steel core to a pre-chamber **3, 13** (Fig. 1 and 2, Col. 5, line 33 and 68), but does not teach that it has a second pressure higher than the first pressure. Yoshikawa discloses that the substrate surface is cleaned in an argon plasma prior to depositing the sputtered coating (Col. 8, lines 55-60).

Chambaere teaches cleaning metal substrates, such as a metal wire, in an inert sputtering gas such as argon at a pressure of 0.01-10 torr (0.013-13.33 mbar) (Abstract, Col. 3, lines 53-67) in order to achieve an excellent cleaning effect.

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use the pre-chamber of Sawada to clean the wire prior to sputter deposition as suggested by Yoshikawa at conditions disclosed by Chambaere in order to achieve an excellent cleaning effect on the wire.

Thus, claims 46 and 47 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Doujak, Yoshikawa, Sawada, and Chambaere.

5. Claims 54-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doujak et al (US 2003/0003319) in view of Yoshikawa et al ('419) as applied above and further in view of Dambre ('249).

Doujak and Yoshikawa do not disclose the step of submitting the steel core to at least one surface treatment.

Dambre teaches submitting a steel wire to a surface treatment, such as pickling, prior to deposition of a brass coating in order to clean the wire (Col. 1, lines 48-62).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to submit the steel core in the process of Doujak or Yoshikawa to a surface treatment prior to coating as suggested by Dambre in order to clean the steel core.

Regarding Claims 55-60, Dambre teaches pickling the core in a pickling bath, washing the pickled core in water, drying the washed core, thermally treating the steel core (patenting), and drawing the steel core before the thermal treatment step. A thermal treatment step may be performed after the surface treatment step (Col. 1, lines 55-65, Col. 3, lines 55-60).

Thus, claims 54-60 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Doujak, Yoshikawa, and Dambre.

Response to Arguments

6. Applicant's arguments filed 1/19/2010 have been fully considered but they are not persuasive. Applicant argues that the Office has not shown why one of ordinary skill in the art would have replaced the electro-deposition coating method of Doujak to form an alloy in view of Yoshikawa with any reasonable expectation of success. The examiner disagrees. Yoshikawa discloses forming a similar product as that of Doujak wherein a metal film (e.g. zinc, copper, or alloy thereof) is deposited onto a steel core

such that a rubber composite may have better adhesion to the steel core. Yoshikawa discloses that depositing metal films within the range of 1-1000nm is desirable because the film has little influence on the properties of the final composite product (i.e. rubber composite deposited onto steel core) (Col. 6, lines 27-34). Thus, it would have been obvious to deposit layers having a thickness disclosed by Yoshikawa during the process of Doujak in order to form a desired final composite product. Further, Yoshikawa discloses that when depositing a metal film (e.g. zinc, copper, brass) by electro-deposition, as is performed in Doujak, the film tends to be irregular in thickness unless the thickness exceeds several microns. This thickness detracts from the flexibility of the resulting composite material (Col. 2, lines 12-27). Thus, it would have been obvious to deposit the films of Doujak using the plasma method of Yoshikawa in order to form thinner films having uniform thickness and form a more flexible composite product.

Applicant argues that Doujak discloses depositing 3-7 layers and Yoshikawa discloses depositing a single layer, rather than multiple layers. Thus, there is no teaching or suggestion that the single layer of Yoshikawa would be suitable as a substitute for the multi-layer coating of Doujak. The examiner disagrees. Doujak discloses forming an alloy by depositing alternating metal layers (e.g. zinc, copper) by electro-deposition [0008] and forming an alloy during the drawing process (Abstract). Since Yoshikawa discloses that **zinc** or **copper** layers may be deposited by plasma deposition such that thinner films having uniform thickness may be deposited as compared to electro-deposition, it would have been obvious to the skilled person to deposit the alternating zinc and copper layers of Doujak using plasma deposition in

order to form thinner films having uniform thickness and then alloy these layers by the drawing process. Yoshikawa does not disclose depositing multiple layers, but does disclose a suitable alternative deposition method (i.e. plasma deposition) for depositing the same types of layers (e.g. zinc, copper) as Doujak, wherein the method of Yoshikawa has advantages over the electro-deposition method used in Doujak.

Applicant argues that one of ordinary skill in the art would have no motivation to modify Doujak in view of Yoshikawa because Yoshikawa solves a problem that is not present in Doujak, such as forming adequate bonds without use of cobalt in the rubber compositions. The examiner disagrees. Doujak discloses bonding a rubber composition to the metal alloy, wherein optimum adhesion is achieved by selecting the composition and thickness of the most external deposited layer [0009], [0070]. Since Yoshikawa discloses that zinc and copper layers form a firm bond between the substrate and rubber composition and that a uniform thickness may be obtained and controlled using the plasma deposition method (Col. 3, lines 38-50, Col. 6, lines 5-11), it would have been obvious to use the deposition method of Yoshikawa to provide the improvement of thickness uniformity and thickness control to the process of Doujak. Yoshikawa discloses an alternative method for deposition of the same layers and for the same purpose of Doujak which is forming a firm bond between the steel core and the rubber composition.

Applicant argues that Doujak and Yoshikawa fail to teach coating with more than 25 layers which is implied in the claims since each layer has a thickness of 0.5-20 nm and the total initial thickness of the layers prior to drawing is 0.5-2 um. The examiner

agrees that Doujak only teaches about 3-7 layers because the electro-deposition becomes more complicated as the number of layers increases [0045]. However, Yoshikawa discloses that the same types of layers (e.g. zinc, copper) as used by Doujak may alternatively be deposited onto a steel core by plasma deposition wherein thinner films may be deposited having a uniform thickness as compared to the thicker films required by electro-deposition. This allows more flexibility of the final composite product (see discussion above). Since Yoshikawa discloses that thinner layers may be deposited having a uniform thickness, it would have been obvious to deposit a desired number of alternating layers during the process of Doujak in order to obtain a desired thickness of the metal coating prior to drawing, such as the 0.75-4 um thickness disclosed by Doujak. Using the thinner layers of Yoshikawa for the alternating layers of Doujak would have the advantages of optimizing the adhesion of the rubber composition since Doujak discloses that the adhesion is optimized by selecting a composition and thickness of the outer layer and of providing more flexibility to the final composite product (Yoshikawa, Col. 2, line 27).

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Burkhart whose telephone number is (571)272-6647. The examiner can normally be reached on M-Th 7-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Elizabeth Burkhart/
Examiner, Art Unit 1715

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1715